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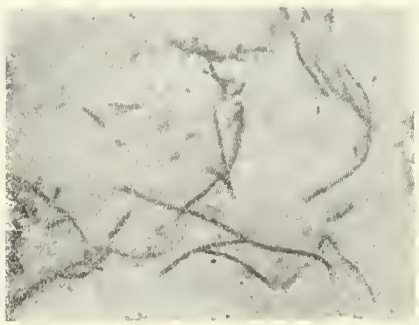
Are There "Missing Links" in Plants?

By RALPH H. CHENEY

THE steps by which plants evolved are made clear by the similarities of structure between ancient fossil plants and their living kin of today. In the March issue of EVOLUTION, Dr. Florence D. Wood has already shown that the relationships within the basic plant groups can be definitely worked out from living forms. But to trace satisfactorily the descent of one major group from another requires the help of the fossil record, which, fortunately, is quite adequate. The missing links are in fact very few.



Fossil Bacteria a Billion Years Old. (Magnified 180 diameters)

The anti-evolutionists often make much of the apparent absence of connecting links between the major groups of animals, but they cannot complain on that score as far as the plants are concerned. For the fossil plant record is singularly complete. This difference between the animal and plant records can readily be explained by the fact that nearly all the basic groups of animals had already evolved at the opening of the Cambrian period when our better preserved fossil record begins. On the other hand, all but the lowest of the great groups of plants have arisen later, in the time covered more or less adequately by the geological record, so that we can demonstrate quite clearly each transition from group to group. The story of the development of the four major groups of plants, one from the other, is well substantiated by several parallel lines of evidence, fossil and otherwise.

Each living species of plant is, of course, descended from older forms, but these ancestral forms may or may not have survived to the present day. In view of all the vicissitudes to which fossils are subject, it is unreasonable to expect always to find in fossil form the direct ancestors of living species. Most evolutionary series represent merely the structural stages through which the plant kingdom has passed in producing the more complex and modern types of plants. The record is most complete for recent forms, but there are also numerous fossils of the lower forms, in fact a rather surprising representation when we consider the almost incredible age of these forms and the many destructive geologic upheavals to which they have been subjected since their time. Though it must be admitted that the remains of the Mosses are but fragmentary, the fact of plant evolution is well established by the abundance and completeness in detail of the fossil records proving the definite development of the Gymnosperms (cone-bearing evergreens) from fern-like seed plants and of the higher flowering plants from these Gymnosperms.

The earliest forms of life must have been plant-like organisms, for only plants can manufacture foodstuffs out of mere mineral matter, gases and water. It is to be expected, therefore, that the earliest fossils would be simple plant types, and so they are. In the Proterozoic deposits, from which no sure signs of animal life have yet come, have been found fossil bacteria and Blue-green Algae (one-celled or chains of cells such as pond-scum), these being also the simplest plants alive today.

Plants, as well as animals, lived only in the water during the earliest stages of their racial development. The Liverworts, the most simply constructed of all Mosses, were the first plants to develop sufficient protection against surface evaporation to solve the problem of existing on land. They lacked true roots or stems, their bodies consisting of flat, membraneous masses that formed an overlapping, carpet-like mat covering exposed areas. This important step from water to land was probably taken early in the Devonian.

In their further progressive evolution, the plants left a fossil record of achievements in structure which accords well with the order of development inferred from the evidence of living structures. During the

THE PLANT FOSSIL RECORD

(READ FROM BOTTOM UP)

(Figures show millions of years ago)

GEOLOGICAL AGES ERAS	PERIODS	*When the major plant group records began*
Cenozoic.	2 Quaternary	
	60 Tertiary	Flowering plants became dominant.
Mesozoic.	125 Cretaceous	Angiosperms (flowering plants).
	155 Jurassic	
	190 Triassic	True pines.
	215 Permian	
Paleozoic.	Upper 250 Carboniferous (Pennsylvanian)	First Gymnosperms (pines, etc.). Cycad (sago palm). (Age of giant ferns, club mosses and horsetails.)
	Lower 300 Carboniferous (Mississippian)	
	400 Devonian	Seed ferns. True ferns. Club mosses and horsetails. Woody stems. Liverworts and true mosses.
	Silurian	
	Ordovician	
	720 Cambrian	
Proterozoic.	Keweenawan. Animikian.	Algonkian — Brown algae (seaweeds).
	1200 Huronian	Blue-green algae (pond scum). Bacteria.
	Sudburian	
Archeozoic.	Keewatin	
	Grenville	

Early Devonian Land Plant: (a) Spore Cases, (b) Spine-like Leaves, (c) Wood-Cells of Stem

Upper Devonian Seed-Fern

Typical Forest of Carboniferous Giants

Devonian period notable advances were made, such as the development of woody stems for support (with their water conducting "pipe-lines"), and true leaves. From the simpler woody-stemmed, but quite leafless ancestors of the ferns in Devonian strata, we can trace the steps to the forests of giant Club Mosses and Horsetails of the fern family found so abundantly in the Carboniferous coal measures. Already in Upper Devonian times, seed-ferns had developed from the true ferns, and these seed-ferns through a definite fossil series gave rise to the modern cone-bearing Pines and other Gymnosperms. The flowering plants (Angiosperms) first appear in the middle Cretaceous only eighty million years ago. The fossil remains of our modern major plant groups therefore appear in the same geological order as the complexity of allied present forms would demand. The fossil record convincingly establishes the fact of plant evolution.

How the Shark Gave Man His Teeth

By MAYNARD SHIPLEY

AS the sharks are the lowest family of true vertebrates in the line of man's ascent, it is not surprising that man inherited the shark's teeth along with his spinal column, which in the shark's case is made up of segments of cartilage.

Perhaps this article should have been entitled, "How the Shark Got His Teeth." As all the higher vertebrates got their teeth from the shark, what we need to learn is where he got the teeth he bequeathed to us.

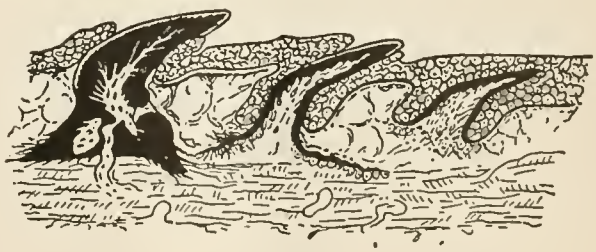
We know no animal before the shark that had true teeth, such as could develop, through the ages, into those of the apes and man. So the earliest sharks could not inherit their teeth but had to develop them.

But everything in this world has developed from something pre-existing. There could not have been land animals with lungs unless there had been fishes with swim-bladders; and if reptiles had not had scales, the birds that followed would not have had feathers. And so, to get back to teeth, had there been no fish with tooth-like (placoid) scales, there might have been no fish or other animals with teeth like ours.

It happened some four hundred million years ago in Devonian times, when much of the interior United States was an inland sea. Abundant fossils found there tell us the waters were prolific with sharks, especially with one family which the scientists give the jaw-breaking name *Cladoselachidae*. There still flourish, along the Atlantic Coast, sharks closely akin to them. These modern survivors have also been given a name to tax the articulating mechanism of the tired business man, but we shall call them dog-fishes for short. It was the ancestor of the spiny dog-fish who developed real teeth, all over his body, from his placoid scales.

"But," someone objects, "teeth don't grow all over the body—thank heaven!" No, but the early Cladoselachian grew his scales all over the body and right over the snout and into his mouth where they became teeth. In fact these scales were real teeth. For if you could conveniently coax a shark ashore, extract one of those teeth and compare it under the microscope with one of your own, this is what you would see:

These teeth within the shark's mouth are of course greatly modified, but in origin and structure they are similar to the scale spikelets all over the body. Beginning with the horny layer that covers the spikelet, we come next to a layer of tall, column-like cells, set at right angles to the surface of a lower layer of genuine enamel—in fact these columnar cells secrete the enamel—the hardest substance in animal bodies. In the higher animals, this enamel is only found as the covering of the dentine of the teeth. The dentine of



Spikelet Teeth (Shagreen Denticles) of Modern Shark Breaking Through Skin of Mouth

the spikelet surrounds a pulp-like cavity and is formed of hardened, bone-like skin tissue which contains no cells. The sensitive connective tissue in the pulp-cavity sends processes into the dentine, the dentine canals.

Such is the description of the spikelet on the shark's body. But it is also the description, so far as it goes, of the tooth of man, from the enamel down. And if we follow these spikelets over the shark's nose and down into his mouth—being sure, of course, that the shark is well dead—we will find that there they will develop from the skin inside the mouth just as they did on the shark's sides. Through millions of years of variation and natural selection they have gradually flattened (some at least) into blade-like cutting teeth with serrated, or saw-like, edges. Often, too, several teeth are fused into one, developing from a deep fold of the skin lining the mouth.

In mammals there is also a deposit of cement on the root and sometimes also on parts of the crown. But in no animals do the teeth form any real part of the bony framework. Like hair, fur, scales, feathers, horns and nails, they originated in and developed from the skin. And in all animals higher than the shark, the teeth, however profoundly modified by millions of years of evolution, still bear clear traces of their descent from the tooth-like scales of a family of Devonian sharks.

Brains—How Come?

By ALLAN STRONG BROMS

VII

MAN brags about his gray-matter. Rightly so, for it's his big asset. But the other animals, apes especially, have a lot too, only not enough. Gray-matter is the switchboard of man's nervous and thinking outfit, and he has won over the other animals by adding a lot to the board.

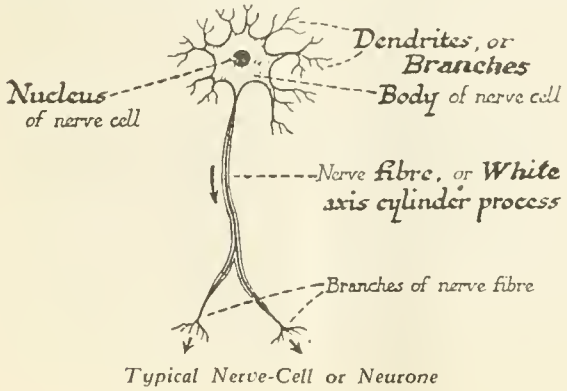
Under the microscope, gray-matter shows up as a myriad nerve-cells bristling with fine branches. These branches make the contacts for plugging in connections on this most complicated of all switchboards. Complicated! Man has nine thousand million nerve-cells in his brain alone, each with a lot of branches.

Another kind of nerve stuff, the white-matter, consists of long fibres, really long-distance wires to and from the gray-matter nerve-cells. Their business is to carry messages in and out, fact messages inward from sense organs (eyes, ears, nose, tongue, skin) and orders outward to muscles and glands that do the body's work.

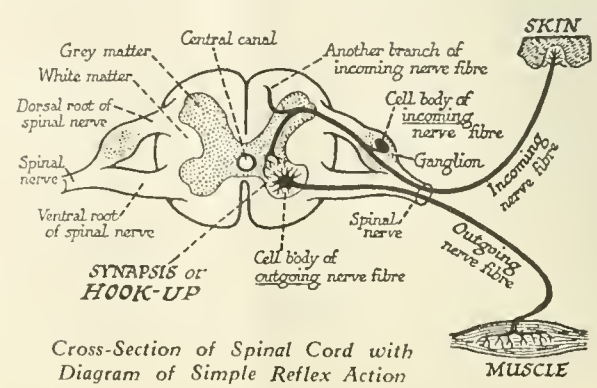
An unborn human baby starts off with a brain and nervous system consisting of a mere tube or cord running the length of its body and tail. Some early fish ancestor had no more, just a simple spinal nerve cord to keep head and tail in touch and working together. But the head end, with its mouth, nose, eyes and many contacts, had much business to keep in order, so its end of the nerve cord swelled into a brain-knob, a central headquarters. As time went on, headquarters made new outside contacts, through ears for instance, and took on new jobs, such as talk. So the brain-knob grew big and complex and expanded in new directions. And the baby brain, in its few months of growth, sums up this evolution of our ancestral brains which gave man such a swell head.

But the brain did not take on all the jobs. Some were just local and so simple that the gray-matter down in the spinal nerve cord could better handle them. When your finger touches fire, a white nerve brings in the alarm. Usually the local spinal-cord station in charge of your arm takes care of it, shoots out an order over a second white nerve to "take it away," and the muscles do just that. Meanwhile a third white nerve relays the alarm to headquarters and you *feel* it. Of course, if it's a real four-alarm fire, headquarters takes charge, to do some tall cussing, put out the fire, or yell for help. But usually the alarm is just reported with the good word, "already handled." This local, automatic handling, just in and out, just sensing and doing, is called *reflex action*. The lowest animals depend on it; even we use it a lot.

Gray-matter at headquarters is spread out thin over the wrinkled surface of the big top brain we call the *cerebrum*. Really in sections, each with its own business to handle, the gray-matter all looks alike. Within each section the short nerve-cell branches make local hook-ups, but between sections long-distance white nerves make the connections. These nerves are inside and behind the big switchboard, masses of white fibres, some joining the board parts together, others bundling


Dendrites, or Branches
Nucleus of nerve cell
Body of nerve cell
Nerve fibre, or White axis cylinder process
Branches of nerve fibre

Typical Nerve-Cell or Neurone



Cross-Section of Spinal Cord with Diagram of Simple Reflex Action

into nerve cables that lead out to sense organs, to lower brain centers, to the spinal-cord and the body works. Through the white nerves the brain keeps in touch with outside happenings, gets together its ideas of what to do, and sends out its instructions to the doing organs.

It looks like a great apparatus, but how can that apparatus think? Just watch.

Build a strong, high, mesh-wire fence. Put a hen on one side, chicken-feed on the other. The hen sees, wants and acts—through eye, white optic-nerve, gray-matter hook-up, white motor-nerve, the muscles that act. But the hen hits the fence, fails. She tries again, the same way, fails again. Her hen brain knows just one way, her limit. So she does not eat.

Put a dog on one side of the fence, dog-feed on the other. The dog reacts like the hen, bumps into the fence, fails the first time. It tries again, but in different ways. For its gray-matter has several hook-ups. It tries all ways, one after the other—jumping over, digging under, breaking through, running around the end. At last one way works. The dog eats. The next time it does the right thing sooner. After several times, does it first. The right gray-matter hook-up has become *habit*.

Now put a man on one side, his food on the other. He sees, wants, and goes after it. He acts too, but not with his body, not yet. He acts first in imagination. One way after another. For his gray-matter also hooks up in several ways. One urges, "climb over," but an idea stops the urge. "Too high." That idea just came in over another hook-up from the eyes. A second cell urges, "dig under," but another idea blocks it, "ground too hard." Urges to break down, reach through, forget it, are all blocked by obstructing idea hook-ups, and none go into action. But one urge, "go around the end," is not blocked. Through eyes, white nerves, gray-matter, comes the information that the fence is short. That goes with the urge, not against it. So the urge goes through, into action, with success. The man eats. He gets results, quickly, easily, without waste of physical action.

Every nerve message tends to become (reflexly) a nerve urge to act. The hen acted, one way only, was stopped physically. The dog acted, several ways, was stopped physically, except one way. The man acted too, in several ways, but in gray-matter tryouts first. His acts were stopped too, except one, but mentally, not physically. His were stopped by gray-matter "don'ts," by idea hook-ups that obstructed unpromising urges to action. We say he stopped to think. What he did was to act out his urges mentally to see if they would work. Only the workable urges went through into physical action. That way he saved time and effort. We call that *adaptive thinking*. Simple enough. Just some gray-matter hook-ups. But they made man master. He had more than the beasts.

The next article will be just "Talk! Talk!! Talk!!!"

The Earliest Bird

By FREDERIC A. LUCAS

WHEN we come to the topic of the earliest bird—not the one in the proverb—we are limited to the famous Archaeopteryx from the Solenhofen quarries of Germany, which at present forms the starting point in the history of the feathered tribe. Birdlike, or at least feathered, creatures must have existed before this, as it is improbable that feathers and flight were acquired at one bound, and so it may be that some of the three-toed tracks in the Connecticut Valley were really footprints of birds. Not birds as we know them, but still creatures wearing feathers, these being the distinctive badge and livery of the order. No bird is without them, no other creatures wear them, so the birds may be exactly defined in just the two words, *feathered animals*. The exclusive mark of birds is therefore not flight but feathers, though in penguins, the feathers have so changed that their identity is almost lost.

By putting various facts together we obtain some pretty good ideas regarding the appearance and habits of the first birds. The immediate ancestors of birds, their exact point of departure from other vertebrates, are yet to be discovered; at one time it was considered that they were the direct descendants of Dinosaurs, or that at least both were derived from the same parent forms, and while that view was almost abandoned, it is again being brought forward with much to support it. It has also been thought that birds and those flying reptiles, the pterodactyls, have had a common ancestry, and the possibility of this is still entertained. Be that as it may, it is safe to consider that back in the past, earlier than the Jurassic, were creatures neither bird nor reptile, but possessing rudimentary feathers and having the promise of a wing in the structure of their forelegs, and some time one of these animals may come to light; until then Archaeopteryx remains the earliest known bird.

In the Jurassic, then, when the Dinosaurs were the lords of the earth and small mammals just beginning to appear, we come upon traces of full-fledged birds. The first intimation of their presence was the imprint of a single feather found in that ancient treasure-house, the Solenhofen quarries; but as Hercules was revealed by his foot, so the bird was made evident by the feather whose discovery was announced August 15, 1861. And a little later, in September of the same year, the bird itself turned up, and in 1877 a second specimen was found, the two representing two species, if not two distinct genera. These were very different from any birds now living—so different, indeed, and bearing such evident traces of their reptilian ancestry,

(*Continued on Page 7*)

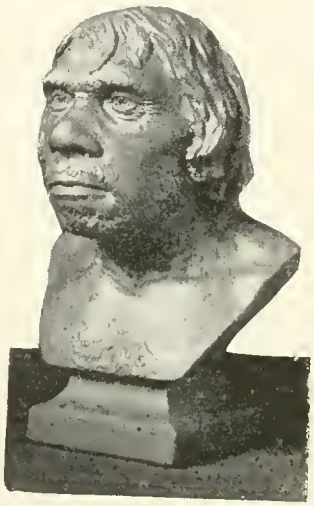
The Lost Race of Neanderthal

By EDWARD GRIEG CLEMMER

THE Neanderthal race lived in the middle of the Old Stone Age, during the fourth glacial epoch when Northern Europe and England were covered with ice. In the arctic cold that swept down through Europe lived such animals as the lemming, muskrat and arctic fox, while the mammoth, wooly rhinoceros and reindeer roamed over England and France.

The rigorous winters drove Neanderthal man to the shelter of caves, making the preservation of his remains more certain. In summer, of course, he lived outdoors. Neanderthal man was also first to bury his dead, again insuring that his remains would be found by later generations.

The first Neanderthal skull, found at Gibraltar in 1848, got little attention. In 1856 another was found in a small limestone grotto in the Neander Valley, Germany, from which the race received its name. Other remains have since been found on the banks of the Thames, the Somme, Rhine, Danube, and Meuse, in Wales, France, Belgium, Italy, Germany, Spain, Switzerland, Austria, Poland, Russia, Asia Minor, Africa and Egypt, the wide distribution proving this to have been the dominant race of the time.



Neanderthal Man as Restored by J. H. McGregor

As these remains run from small fragments to practically complete skeletons, our reconstructions are based on facts. We do not have to rely on inferences drawn from scanty fragments, as we have to with earlier types of men. Here the whole story is laid before your eyes.

The race was short in stature, the men varying from five feet to five feet, five inches. A lone female skeleton is four feet, ten inches tall. The skull is very large for primitive men, with a cubical content almost equaling our own. The shape, however, is far from modern. The upper borders of the eye sockets formed a high ridge which must have given a very ape-like appearance. Back of this ridge, the low forehead sloped back very sharply. The front teeth, sloping forward, gave him a protruding mouth, further emphasized by the lack of a pointed chin.

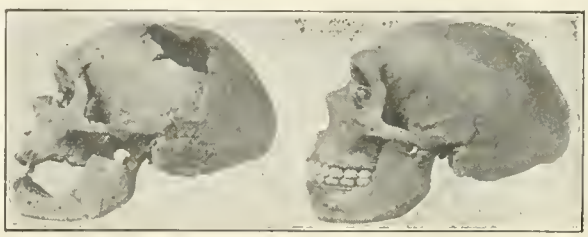
Below the incisor teeth of modern man are short projections of bone which give attachment to certain muscles of the tongue. These muscles give the tongue great flexibility and thus make for highly developed speech. In the apes these bones are merely slightly rounded prominences. In Neanderthal man they were more highly developed, but not yet as long and sharp as in modern man. This indicates a moderately developed organ of speech, permitting only a partially complete language.

The heavy, short backbone made only one curve from hips to skull. Our own backbones have an S-shape, a hollow at the small of the back, a protrusion at the shoulders and a hollow at the neck. All this helps absorb the shock when we land from a jump. The Neanderthaler had to break the shock by letting his head fall forward. Also the hole in the floor of the skull through which the spinal cord reaches the brain is set farther back than in moderns. Evidently, the neck sloped more to the front than our own. From the way the thigh bone met the shin and hip, we also know that Neanderthal man could not stand fully erect.

Sir Arthur Keith has made the interesting suggestion that perhaps the Neanderthal type was due to some peculiar working of the pituitary gland. It is one of the endocrine glands which secrete and pour into the blood stream certain substances called hormones, chemical messengers which stimulate other parts of the body to do or develop in certain ways. When the pituitary gland, situated at the base of the brain, becomes enlarged in modern man, Neanderthal-like characters are developed in exaggerated forms. Hence Keith's suggestion that Neanderthal man was a "hormone" product.

The tools of this race give us an insight into their everyday life. Their method of tool-making differed from those of preceding races. Instead of chipping down a large piece of flint to the desired form, the Neanderthaler struck off a number of chips and then selected the most likely, fashioned them further if need be, or used them as they were. Though not an advancement in skill, this was a great time-saver.

The two principal types of implements were the point and the scraper. The point was shaped from a triangular chip, the bulb end forming the base, the two sides tapering to a well-defined point. The sides, chipped finely, gave a single good cutting edge. The base, also made thinner, suggested that the points may have been hafted. This implement served as drill, punch, or point for knife or javelin. The sharp edge was used for knife blade, saw, or scraper.



A Fossil Neanderthal Skull—the Original and as Reconstructed

The scraper type was shaped from non-triangular chips. Larger and rounded or ob-

long, scrapers were retouched only on one side, the other being used for holding. Sometimes they were made into a sort of axe, both edges being chipped, but only on one surface. These may also have been hafted for a handle.

Crude, improvised bone tools, usually from the lower leg, were probably used for skinning and preparing the hides of animals. As bone is so perishable, we cannot be sure whether Neanderthal man used them more than stone for tools, but from the crudeness of the bone tools, we conclude that they were improvised and used only a few times before being discarded.

The experts agree that this race, once so widely prevalent, became extinct and left no descendants. Their place seems to have been taken quite suddenly by a new race called the Cro-Magnon, thought to have immigrated from Asia.

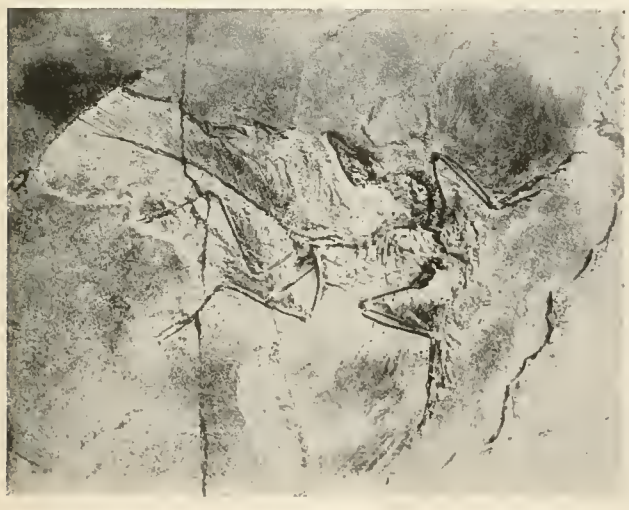
This is third of four articles by Mr. Clemmer on The Ancestors of Modern Man, the next being on The Cro-Magnon People.

The Earliest Bird

(*Continued from Page 5*)

that it is necessary to place them apart from other animals in a separate division of the class birds.

Archaeopteryx was considerably smaller than a crow, with a stout little head armed with sharp teeth (as scarce as hen's teeth was no joke in that distant period), while as he fluttered through the air he trailed after him a tail longer than his body, beset with feathers on either side. Everyone knows that nowadays the feathers of a bird's tail are arranged like the sticks of a fan, and that the tail opens and shuts like a fan. But in Archaeopteryx the feathers were arranged in pairs, a feather on each side of every joint



Earliest Known Bird, Archeopterix, Impressed on Sandstone Slab

of the tail, so that on a small scale the tail was something like that of a kite; and because of this long, lizard-like tail this bird and his immediate kin are placed in a group dubbed Saururae, or lizard-tailed.

Because impressions of feathers are not found all around these specimens some have thought that they were confined to certain portions of the body—the wings, tail and thighs—the other parts being naked. There seems, however, no good reason to suppose that such was the case, for it is extremely improbable that such perfect and important feathers as those of the wings and tail should alone have been developed, while there are many reasons why the feathers of the body might have been lost before the bird was covered by mud, or why the impressions do not show.

It was a considerable time after the finding of the first speciment that the presence of teeth in the jaws was discovered, partly because the British Museum specimen was imperfect (the skull was lacking, and a part of the upper jaw lying to one side was thought to belong to a fish), and partly because no one suspected that birds had ever possessed teeth, and so no one ever looked for them. When, in 1877, a more complete example was found, the existence of teeth was unmistakably shown; but in the meantime, in February, 1873, Professor Marsh had announced the presence of teeth in the diving bird Hesperornis, so to him belongs the credit of discovering birds with teeth.

The first discovered specimen of Archaeopteryx is in the British Museum, the second and more complete example is in the Royal Museum of Natural History, Berlin, and is here shown on its stone slab.

AMPHIOXUS

(A song to be sung with the well-known chorus)
Tune: "Tipperary."

I

A fish-like thing appeared among the annelids one day.
It hadn't any parapods or setae to display.
It hadn't any eyes or jaws, or ventral nervous cord,
But it had a lot of gill-slits and it had a notochord.

Chorus

It's a long way from Amphioxus, it's a long way to us,
It's a long way from Amphioxus to the meanest human cuss.
Good-bye fins and gill-slits! Welcome lungs and hair!
It's a long way from Amphioxus, but we came from there.

II

It wasn't much to look at, and it scarce knew how to swim,
And Nereis was very sure it didn't come from him.
The Molluscs wouldn't own it and the Arthropods got sore,
So the poor thing had to burrow in the sand along the shore.

Chorus

III

It wriggled in the sand before a crab could nip its tail.
It said "Gill-slits and myotomes are all of no avail.
I've grown some metapleural folds, and sport an oral hood,
But all these fine new characters don't do me any good."

Chorus

IV

It sulked awhile down in the sand without a bit of pep,
Then stiffened up its notochord and said, "I'll beat 'em yet.
I've got more possibilities within my slender frame
Than all these proud Invertebrates that treat me with such shame."

Chorus

V

"My notochord shall grow into a chain of vertebrae:
As fins, my metapleural folds shall agitate the sea.
This tiny dorsal nervous tube shall form a mighty brain,
And the vertebrates shall dominate the animal domain."

Chorus

Philip H. Pope.

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ALLAN STRONG BROMS, *Science Editor*

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SKIP MAY AND JUNE

Again we "skipped," we hope for the last time. All subscriptions will, of course, be extended for two months to replace May and June. Every yearly subscriber receives full twelve numbers.

IS EVOLUTION A CREED?

"Evolution is a religion," say the Fundamentalists, "and should therefore be barred from the schools." They claim that the origin of man and this world is a problem for religion alone and that any attempt at solution by scientists becomes perforce religious.

Certainly the religious have tried their hands at the problem and have given answers aplenty—but variant and contradictory. All (but perhaps one) must therefore be wrong. Yet each quotes divine authority and demands unquestioning faith. Thus they are mutually intolerant, which is the real reason for barring all teaching of creeds from the schools. If one be taught, all must be taught; but if all be taught, they contradict and only weaken faith. So wisely they have agreed to forebear and teach none at all. The result has been happy, it has kept out a lot of mental rubbish.

Now science employs a different *method*, the testing of each account by its agreement with the whole body of ascertained fact. Facts are ascertained when they are verified consistently by experiment and observation. Of course, if the problem of origins were, of necessity, exclusively religious, whatever the approach, then certainly evolution would become religion. But if it be a proper problem for study by any result-getting method, then science cannot well be barred just because the religions have made attempts in the same field. Nor should it be barred because its answers differ from those the creeds demand. For the essence and value of the scientific method lie in its free acceptance of the conclusions to which the facts of observation lead. And if the method is valid elsewhere, it is valid here.

After all, what really worries the Fundamentalists is that the conclusions of science contradict their sanctified guesses. And it is quite too late in this age of practical science to deny and defy the scientific method—it works too many useful wonders. So resort must be had, if the creeds are to be saved, to devious argument and confusing appeals. So we hear that science (in the form of the evolution theory) is religion because it confounds the creeds, and must logically and fairly be barred from the public schools. The argument has a shallow appeal. It would be logical and fair—*if it were true.*

But it is not true. Evolution is not a religion. It is a conclusion quite unanimously reached by the scientists of the world on the evidence of the known, pertinent facts. And it is taught, not as an article of faith, to be accepted on divine authority, but as a conclusion which may be drawn from an examination of all the facts that careful research reveals. The student is not asked to accept it blindly, to suppress the doubts, to profess it eagerly. He is asked to examine, to weigh, to test, to judge for himself. He is taught to use his own mind, to derive his own conclusions. That makes for clear, independent, useful, honest thinking. It is the way to mental health, to sound progress, to the truth that shall make us free.—Allan S. Broms.

WORLD LEAGUE FOR SEXUAL REFORM

The World League for Sexual Reform will hold its Third International Congress in London during the week of September 9th-13th, 1929. The aim of the League is to "establish sexual ethics and sociology on a scientific, biological and psychological basis." The subjects to be discussed at the Congress are:

Marriage and Divorce
Birth Control, Abortion and Sterilisation
Sex and Censorship
Venereal Disease and Prostitution

The presidents of the Congress are August Forel, Havelock Ellis and Magnus Hirshfield. Eminent scientists from many countries are expected to contribute to the programme. The American participants include Dr. Harry Benjamin, Dr. William J. Robinson, Margaret Sanger, Dr. A. A. Brill, Upton Sinclair, Dr. Hannah M. Stone, Dr. Abraham Stone and Dr. S. D. Schmalhausen.

Further particulars about the Congress may be obtained from the Secretary, Dr. Norman Haire, 127 Harley Street, London, England.

IF YOU CHANGE YOUR ADDRESS

for the summer, give us your old, as well as your new address, and specify for how long. Of course, we hope your letter will also contain some new subscribers.

CORRECTIONS

An error for which the author was in no way responsible occurred in the article on "The Origin of Man from the Anthropoid Stem" by Dr. Wm. K. Gregory in our last issue. The caption under the illustration should have been "Hand bones of Man and Gorilla," not Chimpanzee, and credited to Haeckel.

Also in the article on "Brains—How Come?" by Allan Strong Broms the printer made brain "convulsions" out of "convolutions." Beg Pardon.

INVEST IN EDUCATION

The following friends have invested in this educational enterprise since last report:

M. M. Cox, $12.00; L. T. B. Light, $200.00; A. Radesinsky, $10.00; Geo. Welby Van Pelt, $1.00; Henry Field, $10.00; H. J. Shelton, $2.00; Ellen R. Nagle, $5.00; Thos. L. Brunk, $1.00; Aaron Levy, $10.00; Grace Potter, $120; B. Goldberg, $10.00; J. Ganau, $5.00; Frances Pilat, $5.00; Bertha Howe, $1.00; W. Gordon, $1.00; Geo. H. Parker, $10; E. S. Wertheim, $5.00; Anna Johnson, $1.00; O. C. Harris, $1.00; J C. Nietzreba, $1.50; Joe Kasper, $1.00; Nancy I. Beebe, $5.00; Alfred Sorenson, $1.00; Harry Lashkowitz, $1.00; M. Mark, $30; Martin Dewey, $200.00; Paul Metzko, $1.00; Chas. Fuchs, $5.00; Henshaw Ward, $20.00; Frank A. Sieverman, $300.00; A. M. Sieverman, $60.00; A Friend, $25.00; W. R. Wharton, $4.50; Total, $1,065.00.

Continuation of this splendid support will enable EVOLUTION to become an effective instrument for popular enlightenment. For every ten dollars paid in a share is issued. Every reader is invited to become a shareholder.

WELCOME, QUEEN SILVER

After a lapse of two years Queen Silver's Magazine appears again, frank and fearless as ever. Her article on "Science versus Superstition" in the May-June number is particularly refreshing. Her rate is 50 cents a year. Address: Route 1, Box 720, Hawthorne, California.

CROWDED OUT

Our feature page "The Amateur Scientist" which is crowded out of this issue by the debate, will appear again in our next.

MORE TRUTH THAN POETRY

The Bible story of creation
With the late plan of salvation
From eternal hot damnation
Leaves the mind in obfuscation.

But from the story of Evolution
Can be drawn a sane conclusion
With very little of confusion—
Then the mind's not in occlusion.

M. MARK.

McCabe-Riley Evolution Debate

Second section of the Debate held at Mecca Auditorium, New York, February 7, 1929, between Professor Joseph McCabe, of England, Science Popularizer, and Reverend W. B. Riley, President of World's Christian Fundamentals Association, on the question: "Resolved That Evolution Is True and Should Be Taught in the Schools." This is continued from our last issue, in which Professor McCabe's first speech and the opening of Dr. Rileys first speech appeared.

REV. WM. B. RILEY (continuing): Then, he did touch slightly upon vestigial remains, those 180 whatever you want to call them, in your body that have no function. I thought I taught him better in the previous debates, and I felt every time he went down to defeat that he wouldn't do that thing again. (Laughter.) But if he won't learn, I will have to instruct him afresh tonight.

Now, I just want to take up tonight a few of those vestigial remains. For instance, let me call your attention to several of them just at this point in my argument. Vestigial remains—what are they? What vestigial remain is there in the human body that has no function? I wish he would just tell me that. And then I can take up that particular one and give attention to it. But, lest he might not get to them, I will give attention to a few of them just in passing.

Take the appendix! The average man has that cut out, because the modern scientist (?) has told him that it has no function, and the physician is perfectly willing to accommodate him for a few dollars, or several, as the case may be. So he has it cut out.

Let us see whether it has a function or not. Dr. Howard Kelly of John Hopkins University, one of the first authorities in America, says this: "It increases the extent of the intestinal mucous surface for secretion and absorption and is very valuable." (Applause.) All right. There is your answer to that.

A few years ago the thyroid glands were called useless glands. They are located on either side of the windpipe, just below the larynx. It is now conceded by Dr. Vincent that "defective thyroid function, in the mother, is the essential factor in the production of cretinism." You know that effects both body and mind! Dr. C. W. Saleeby says: "It provides iodine for the body without which no man can live. Without enough of it in the blood, an expectant mother is imperiled, and her babies cannot be normally born." He further says that "the thyroid saves a vast amount of ugliness, idiocy, deaf-mutism, and possible cancer."

Some years ago I was on the train going out to the Pacific Coast. I picked up a paper. Professor Lull of Yale University had an article in it in which he spoke of another vestigial remain, namely, one that is found in the head known as "the pineal gland." It is located on the top of the head. It is a little organ about the size of a grain of wheat, located in the roof of the third ventricle of the brain.

Now, Lull said that undoubtedly that was the remains of a single eye left over from one of our mud-loving ancestors. He had that one eye so that he could wallow himself in the mud, and leave that eye above and look around and see if there was any danger approaching. (Laughter.) That is exactly what he said. I have the Doctor's article at home.

Dr. Swale Vincent, professor of physiology in the University of London, says that "the pineal gland is the most important organ in the human body and regulates entirely the growth of the body itself and determines especially sexual development; it also controls the inflow and the outflow of the cerebral fluid and cannot be dispensed with."

Doubtless, when we know more, we will discover that God didn't make as many mistakes as we imagine, and that every single feature, natural to the human body, was divinely appointed and has important functions to perform. It is too bad that my friend McCabe was not there when God was making Man so that he could have told him a lot of things to leave off.

Do you know, if there is any one thing that I would call a vestigial remain, it is my finger nail. We do not claim its usefulness since climbing is no longer our animal custom. According to the McCabe view, we do not need it. We don't run on the ground as the hogs do. Why the nail? I smashed my thumb six months ago, and the nail hasn't grown perfectly as yet, and I can't open my knife.

I tell you, there are no vestigial remains! Every single part of man functions! I want to tell you that I never had a particle of my body cut away. Not a thing! I still have my appendix. I have my tonsils. I have everything that God gave me, and they all function. That is why I beat the Professor so often.

Now, I want to call your attention, in passing tonight, to another thing, and that is this: that when the Professor would have you believe that all these people are absolutely agreed, he is just playing with you; that is all. I'll show you how far they agree.

The Professor believes and teaches in his books everywhere that we came up from animal life, and that we have a bestial pedigree, first, and then it runs clear down to the fishes, to the gill slits. Yes, he actually believes that, and that is what they teach you young men and women in school!

I challenge any physician living to tell me that there are gill slits in the human foetus. The human foetus is never, never at any stage characterized by gill slits. I come of a line of physicians. My brother is one, my sons are physicians. There are no gill slits in the human foetus! I dare you to say that there are, and I will go and disprove it in the laboratory.

Professor Huxley asked a student one day: "What is a lobster?" The student said: "A lobster is a red fish that moves backward."

Professor Huxley said: "That is a very good answer but for three reasons: It is not a fish; it is not red, and it does not move backward. Aside from that your answer may stand." (Laughter.) So of human gill slits. They are neither gills nor slits, but folds only!

I suppose that most of you have had your attention called lately to what Professor Austin Clark said a little while ago. Professor Austin Clark is a graduate of Harvard University. He was sent on that zoological Venezuela research expedition in 1901. In 1903 he went to the Lesser Antilles on a kindred expedition. He is a member of the Royal Geographical Society, and since 1908 of the Smithsonian Institute staff.

Now, listen to what he has to say (reading): "So far as concerns the major group of animals, the creationists seem to have the better of the argument. There is not the slightest evidence that anyone of the major groups arose from any other. Each is a special animal —complex—closely related to the rest, but appearing as a special and distinct creation."

Professor La Conte of the Pacific Coast, one of the finest scientists we have had in America, said years ago (reading): "The evidence is now that these species appear, exist for a certain time, and pass away, to be succeeded by other of a wholly different character and never by transmutation." And when you take transmution out of this doctrine, it collapses of its own weakness, as Spencer and others said of it.

I have never been parading the virtues of Henry Fairfield Osborn. I cannot forgive him the Hall of the Age of Man. It is a hoax, as I am able to prove.

But, I am going to quote from Professor Osborn and from your Herald Tribune of recent date. Just listen to this (reading): "The causes of evolution will probable never be known to us any more than the causes of gravitation.

"Science is coming up against a blank wall in biological sciences and when we do, our studies will be restricted to modes and processes of evolution which we know to exist. If the bones of a man that existed 15,000,000 years ago are ever dug up, they will be of a man which has as fine potentialities, fine hands and limbs, not different from ours. Man has his own ancestry."

Now, listen to this (reading): "We are rapidly coming up against a blank wall in biological science." How can it be otherwise when they have followed a false trail?

Mark again. "If the bones of a man that existed 15,000,000 years ago are ever dug up," etc., what a combination of sense and non-sense! Sensible in denying monkey ancestry and so repudiating the hoax, "The Hall of the Age of Man!" Nonsensical in supposing man existed 15,000,000 years ago, "if he isn't dug up." Yes, if he ever is! These gentlemen simply deal in pure suppositions.

Mr. Darwin, in two of his great works, uses suppositions over eight hundred times, and an unlimited series of suppositions do not constitute a science. "Science is knowledge gained and verified by exact observation or experimentation and especially as related into a rational system," and with that definition this doctrine of assertions has no kinship.

Now, on that last sentence I agree with the gentleman, and as for the first, I will just wait until he digs up the bones of fifteen million years ago, and then I will agree with him on that.

Don't impose upon my children a doctrine that has nothing but supposition as a basis for it. (Applause.)

I have no objection to teaching the truth. All truth is in harmony, absolute harmony. No truth can clash with another truth. That would dethrone God himself. But I object to the teaching of a false science, a science falsely so called in the name of truth.

And I particularly object to imposing that upon the minds of the children of parents and taxpayers who know it be false.

It is quite the custom now to call anti-evolutionists backwoodsmen, ignoramuses, and all the other nice terms that they apply to us. But does that prove anything? I want to ask you whether that question is vital to the subject at all or not. We believe in a free government in this country, do we not?

I have visited in Tennessee since I was a lad, for I was brought up fresh over on the Kentucky side. I have not known a sweeter and more cultured people in my somewhat extended travels than I have found in Tennessee. I have spent some weeks in Arkansas in the last year. The Arkansan is what these evolutionists are denouncing now as ignorant hill-billies!

Ignorance is now located in Boston and vicinity. You Boston people will forgive me, for you are the exceptions.

But look what you have around you in all your factory towns, and you will no longer parade the intellectuals of the hub. No longer. Arkansans and Missisippians are not what they are being called.. They are intelligent folk.

And if they were as ignorant as the evolutionists make them out to be, would you deprive them of the right of ballot? They decided whether they wanted imposed upon them a doctrine which they do not believe and a doctrine which they believe is absolutely detrimental to all morality. Is not that the sovereign right of any free people?

You wipe out God of existence in the mind of man, as this philosophy does it, for it is atheistic by nature and character, and you wipe out the decalog—the basis of all law!

There isn't a man that believes in the doctrine of evolution thoroughly and at the same time holds to the divinity of the law as recorded in the Old Testament book, the basis of all law in all the world.

When you wipe out God, you wipe out the law, and when you have produced a lawless people, you have produced a criminal people at the same time. (Applause.)

* * *

THE CHAIRMAN: Professor McCabe will now speak for twenty minutes. (Applause.)

PROFESSOR JOSEPH McCABE: Your Honor, ladies and gentlemen: You New Yorkers have heard what it is that has moved Arkansas and Tennessee and Kentucky. I say that you have now heard in New York and I will not say what arguments, but on what kind of rhetoric Arkansas and Tennessee have been moved to delete evolution from their textbooks.

During the time that Dr. Riley was talking to you he entirely ignored every argument that I used. (Ap-

plause.) I gave you a clear, intellectual outline of the position of scientific men, not of one scientific man here and there. I don't talk to you of the men of twenty-five or thirty years ago. Thirty and forty years ago there were certainly obscure points in science. What is it to you to go back thirty or forty years ago and discuss what differences there were between scientific men of that time?

The proposition I lay before you tonight is that for the last twenty-five years at least all the scientific men in the world are agreed upon the fact of evolution. Against those scientific men are only a few ministers of religion, and I submit tonight that their arguments are not even respectable. (Applause.)

But, as our time is short—Dr. Riley wishes this debate short, because he must go away tonight; I was hoping to have still another half an hour, but you understand, he wishes to curtail this debate, and then he will have twenty minutes for jokes, and I will have five minutes to wind up the whole talk.

Why could not Dr. Riley address himself intellectually to the case that I put before you? Why not? I put before you five lines of evidence on which all the scientific men in the world are agreed. And I most particularly want to know what is the meaning of the convergence, the coincidence, of those five lines of evidence? That from the scientific point of view is one of the weightiest arguments that you could possibly produce. Not one single word was said about it from beginning to end. I take, therefore, just a few points that Dr. Riley made.

Remember what we are doing: In one scale are all the scientific experts in the world; in the other scale are the jokes of Dr. Riley and the points which I am going to examine. (Laughter.) First, he said all scientific men in the world are not agreed. I was invited into this country three years ago to lend a hand in this evolution matter. I read the entire anti-evolutionary literature of America. From that I selected the names of thirty scientific men who are being quoted in those western and southwestern states as scientific men who deny the fact of evolution. Where are those thirty names tonight? Not a single one of them. I debated with six leaders of the fundamentalists, those who are telling Tennessee and Arkansas that scientists are not agreed. I debated with Dr. Riley before. I have no quarrel with any intelligent believer. I have a quarrel with the man who will dupe and deceive on the whole scientific question.

Scientists are not agreed, he says. First, he mentioned Professor Austin Clark. There is no such professor in America as Austin Clark. Mr. Austin Clark is a young, scientific man who has made a life-study of sea-urchins. Will Dr. Riley explain how a life-study of sea-urchins makes a man an authority on the evolution of man? Will Dr. Riley show me a paper or any work of Mr. Clark in which he says that any living thing on this earth was "created"? He is an evolutionist. Everybody knows that he is an evolutionist. He gives an opinion as to the mode of evolution, but I want to see his own words where he has ever said that living things on this earth were created.

Then Dr. Riley quoted La Conte, who not only died about forty years ago, but was in his time the most zealous evolutionist in this country.

Then we had Professor Osborn, and I am sure when the echo goes around tonight that he was quoted in connection with this debate, you will hear a little in your papers from Professor Osborn. Professor Osborn, from whom I differ on many points, is the most prominent evolutionist in this country.

Where are the men, I ask Dr. Riley—remember you are told explicitly scientific men—who are not agreed about evolution? I know that they are not agreed about the origin of life. I know that they are not agreed about natural selection. But when did we ever ask Dr. Riley to let us teach any particular theory of natural selection or the origin of life in the schools of America? No one ever asked that those particular theories should be given to children.

The issue before you tonight is this: Is the fact of evolution true? Particular theories of evolution do not matter to you.

I repeat: All the living experts in the world are agreed and have been agreed for twenty-five years on the fact of evolution, and that is the fact that we want taught in the schools of the world. (Applause.)

I outlined five immense categories of evidence. Dr. Riley complained that I did so slightly. What would you expect in a twenty-minute speech but a slight outline of the massive evidence for evolution? (Laughter.) What did he make of my evidence, first, as to the geographical distribution? And, in particular, what does he make of New Zealand and Australia and their peculiar population?

Why, he says, if your doctrine of evolution is true, your higher forms ought to be evolved in those countries. Which shows that he does not understand even the fundamental idea of evolution. (Applause.) That doctrine of evolution is not that living things go on evolving to higher forms. The doctrine of evolution is that as long as the living thing is suited to its environment, there is no reason whatever why it should change if the change would be no advantage to it. Show me where the world is changing. Show me where the environment is changing, and then ask me for evolution. (Applause.)

If, on the other hand, Genesis is true, all your lions and tigers and elephants and men must have been in New Zealand and Australia, but some great catastrophe occurred, Dr. Riley says, and very neatly destroyed the lions, reduced all just to that level of population, the kangaroo, which the evolutionist says Australia had reached when it was cut off from the rest of the world. Would Dr. Riley now care to tell me why this mighty catastrophe wiped out all the animals higher than the kangaroo and left precisely that lower population?

Then we come to the vestigial remains. I am not going to argue about the Flood tonight. This is the first time I have got any fundamentalist to tell me that behind the whole case is the contention that all those strata of rock, all those animal remains, are the out-

come of a mighty flood that occurred some thousands of years ago. Why, I disdain to argue on such a point.

A Fundamentalist professor in London once argued that position with me and actually pointed out that in England we have whole beds full of fish-like remains. Why, the fish is the only animal on earth that would have had its golden age if there were such a deluge.

When it comes to the vestigial remains, Dr. Riley said, "Why didn't Mr. McCabe give me one idea?" I gave him one. I asked him what were those bits of gristle on the side of his head. Of course, he ignored that. All the medical authorities in the world will tell you that they are quite useless. He knows about this little fleshy body on the corner of the eye. He ignored it. He knows there is another, the hair on the arm. He ignored it.

But he goes to the pineal gland and he goes to the gill slits. It is forty years since any scientific man maintained that the pineal gland was useless. We have been experimenting thirty years, but until we discovered ductless glands, no man could suspect its use.

But when Dr. Riley ridicules for you the idea that that pineal body is the remains of a third eye, why, he has never read one serious word about the subject. You look at a reptile and you will find that third eye standing out like a billiard ball from the top of the head. It runs through the entire series of animal world, sinking lower and lower in the brain. I have seen photographs of the entire thing, and whatever new function the pineal body has turned to, it is one of the most obvious things in the world that it is the third eye in the top of its head. That New Zealand reptile has that third eye perfectly formed underneath the skin of its head.

Then Dr. Riley made fun of the gill slits. Will Dr. Riley tell us what writer he has been reading who talks of open slits? Certainly not my friend Haeckel; certainly no scientific man. There are no open slits as Dr. Riley said. Every scientific man will agree with him. He has got that from a scientific man because the slits in the condition of embryonic development were closed long ago. But the gill arches are still there. And what Dr. Riley has to explain is, not those closed slits, but the circulation of the blood in the human embryo. The arteries branch over exactly as in the fish, and if Dr. Riley can tell me any reason why the human embryo should have every time a perfect blood circulation and heart of a fish, I shall be more interested in that than listening to his jokes about science.

Those are the only points that I have taken down. I mean attempts on serious intellectual points out of Dr. Riley's address. I beg you to understand that I refuse to deal with any but the intellectual and scientific points.

Is there any other point whatever that I have to answer tonight? First, he denies that all scientists agree. Then tell me who disagrees?

Then he sweeps to one side the five lines of evidence I put before you. He ignores entirely the most important topics of all, and runs on to the deluge, runs on to Genesis, runs on to the growth of crime and immorality and heaven knows what.

To that I will only make one reply. It is sixty or seventy years ago since Darwin brought forth the doctrine of evolution. Oh, yes, I know perfectly well that the Greeks of 2,500 years ago had the rudimentary idea of evolution. But Dr. Riley ought to know that it did not perish of its own weakness. Who was the last great representative of Greek scientific thought? Hypatia. Did her doctrines die of their own weakness? No. She was torn from her chariot by a crowd of fanatical monks.

Voices: Hear! Hear! (Applause.)

PROFESSOR JOSEPH McCABE: With broken crockery they tore the flesh from the bones of that last representative of the Greeks, and that was a symbolic act. In one mighty holocaust the whole of the Greek literature and scientific instruments were destroyed by the Christians whom Dr. Riley is quoting to you tonight. I wish to avoid in my debate tonight the subject of religion in evolution. I am dealing with that tomorrow night in the Community Church, but I have been dragged on to this topic.

Crime is expected of the doctrine of evolution. Where was the doctrine of evolution born? England. And every scientific man in England for thirty years has been an evolutionist, and you know what our statistics of crime in England are. (Applause and laughter.) Since Charles Darwin gave his doctrine to the world we have, not in proportion to population, but absolutely, cut down crime in Great Britain fifty per cent. (Applause.)

Why all this merriment? Why not give us facts? I invite Dr. Riley to take up the perfectly serious lines of argument that I have given you. Try again with the geographical distribution of animals. Tell us what did distribute them, and why the distribution coincided perfectly with our evolutionary explanation.

Dr. Riley said, I never proved that it coincided. Does he expect me to deal with all the animals and plants of the world in one evening in a one-quarter of an hour speech? Surely it is more logical for me to demand that he shall tell me at least of one exception. I am waiting for the one exception.

I am waiting for the one exception, the one fossil remain that has been found which is out of place, according to the evolutionary principle. I am waiting for the name of the one heavenly body which is not in perfect accord with the doctrine of evolution. I am waiting for the explanation of why, when we discovered a new instrument, chronology, quite independently of geology, it coincides perfectly with the story that the geologists tell. I am waiting for the answer to these things.

And if Dr. Riley is going to sacrifice the scientific men, if he is going to ask me about the old scientific men when the evidence was imperfect, if he is going to ask us to go back to those early ages, I bring him back to the situation of today. Here is a truth that we have been searching with mighty instruments for thirty years, and all our experts are agreed, while Dr. Riley tells things on which he ventures to differ from all those experts of the world. (Applause.)

(To be concluded in our next issue.)

NEW BOOKS

"WHAT IS MIND?" by George T. W. Patrick, MacMillan Co. $2.50.

When we go philosophizing (metaphysically) we usually wind up nowhere. Scientific theorizing (with its continual checking against fact) really achieves new ground. This most practical truth is once more demonstrated in this brief summary of the answers of the metaphysicians and scientists to the problem of the nature of thought, consciousnes and will. The author has thoroughly digested his authorities and writes most clearly—when the subject permits. It is not the author's fault that the subject often does not permit, for muddy metaphysics can come to nothing but muddy words. Elsewhere he proves how well he can tell this story.

He stands four-square with the recent scientific achievement; that mind and body are not two, but one; that mind is not a being, but a way of doing. His evaluations of behaviorism are soundly appreciative, yet critical. And yet he disappoints. With the emergent evolutionists he gives up the possibility of digging into and eventually explaining those new qualities which spring from new compounds of elements — chemical, organic, neural, social. That certainly is not scientific. Already in the simpler fields of atomic chemistry and physics we see hints of explanations.

Also he shows too much concern over the effects that this view or that may have on "the reality, dignity and spiritual worth of the mind," as if honest and careful scientists could ask any question but one, "Is the view true?" Plain wishful thinking this. He does not seem to have sensed the fact that, in its search for truth, science does not permit such thinking. It is to be regretted that so fine a presentation should be so marred. A. S. B.

"HUMAN EVOLUTION AND SCIENCE" by Francis P. Le Buffe, S. J. Sixth Edition, completely revised, sixtieth thousand. The America Press, New York, 1928. 10 cents.

Two of the three sections of this 32-page pamphlet are devoted to considering whether a good Catholic may believe in the evolution of man. The decision follows: "Thus the Catholic Church has an explicitly definite and official attitude on certain aspects of human evolution. Its attitude is absolutely and irrevocably condemnatory of the evolution of a human soul out of an animal, and of the tribal evolution of man's body; it is also, though not in the same infallible and irrevocable manner, against the evolution of Adam's single body from an animal ancestor." However, in view of the Galileo fiasco, a line of retreat has been left open. "Yet, according to

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theologians, if competent specialists, after thorough and conscientious investigation, should become convinced that the contrary arguments are cogent, i. e., not merely probable, even if strongly so, but clearly decisive, they may represent these views to the Commission, or hold them internally, giving no outward expression to them." Obviously, this section can interest only those who share the theological viewpoint expressed.

The first section of the pamphlet, however, is devoted to "Human Evolution and Science," and to an ostensible consideration of the scientific evidence. In summary, virtually all authorities cited are either no authorities at all, or antiquated; or else short quotations, out of context, are used to convey a meaning differing from that originally intended. (In other words, the usual bag of tricks of the anti-evolution propagandist.) It seems hardly necessary to list examples in detail. The changes are rung on the Piltdown skull, in entire ignorance of the fact that a second case of the same kind of association has been known for nearly ten years. A misleading impression is given that the Heidelberg jaw is mainly reconstructed. As a matter of fact, this fossil jaw is complete, except for a few teeth, and is unrestored. He makes the Rhodesian man sound very modern by listing all characters resembling modern man, and quietly omitting the primitive characters. (This is also a characteristic trick.) A few differences between monkeys and man are cited. Obviously, there must be differences between any two kinds of animals; if there were not, they would be the same kind of animal!

He implies that all our knowledge of the Neanderthal race rests on the original skull-cap discovered. Actually, parts of dozens of individuals, including several skulls and skeletons, have since been found. Under the heading, "Some Recent Fiascos," the "Patagonian skull" and the "second Java skull" are treated as if they were errors of scientists, instead of mere newspaper canards, about on the level of a reported sight of a flock of seaserpents off Coney Island. There is also the usual gloat about Hesperopithecus, discussed by Ward in this journal (Vol. I, No. 6, p. 3). However, the last word may not have been said on this subject. Finally, the denial that gill-slits exist in the human embryo, indistinguishable from those present in a corresponding stage of the shark embryo, is contrary to fact. Obviously they do not develop into gills in the adult, as we have no gills. Citations of this kind could be multiplied *ad nauseam*, but these are a fair sample, as the rest of the discussion is of the same order.

One more quotation: — "The Old Testament and the New Testament both are intelligible only by holding to Adam and Eve, the fall, original sin, the promise of redemption. Deny the oneness of parentage of the human race, you deny the fall, and its consequently transmitted original sin; deny the fall and its consequently transmitted original sin, you deny the need of redemption; deny redemption, you deny Christ, and Christianity becomes the baseless assumption its enemies claim it is." — Horace Elmer Wood, 2nd.

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"Our age of light and marvelous achievement owes all that it enjoys to the light of Christianity, which has made all other blessings possible; and the teaching of the pagan and antimoral philosophy of evolution is a crime against the State, against society, and a menace to that freedom promised to all men by Christianity." Harold W. Clark, "Paving the Road to Anarchy," in Signs of the Times.

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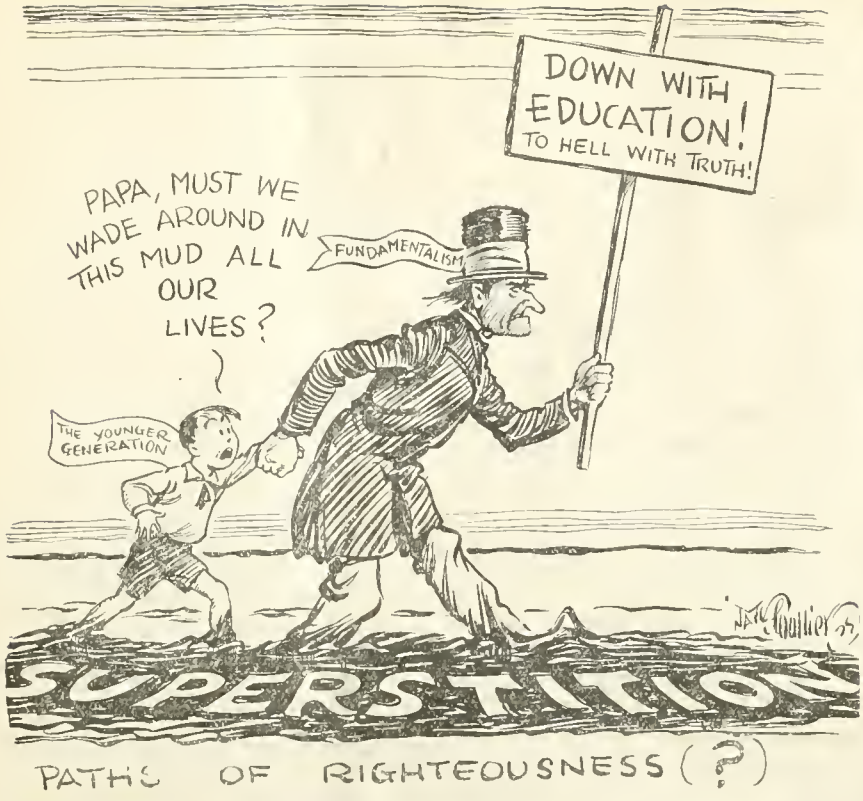

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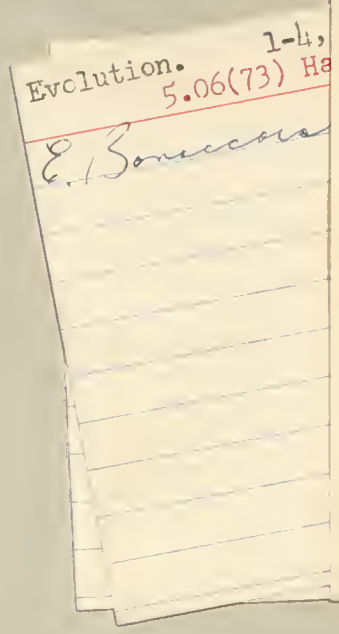

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